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Carbon Dioxide Capture and Storage (CSS) Technology as a Climate Change Mitigation Option: What are the Legal and Regulatory Frameworks for Its Deployment?

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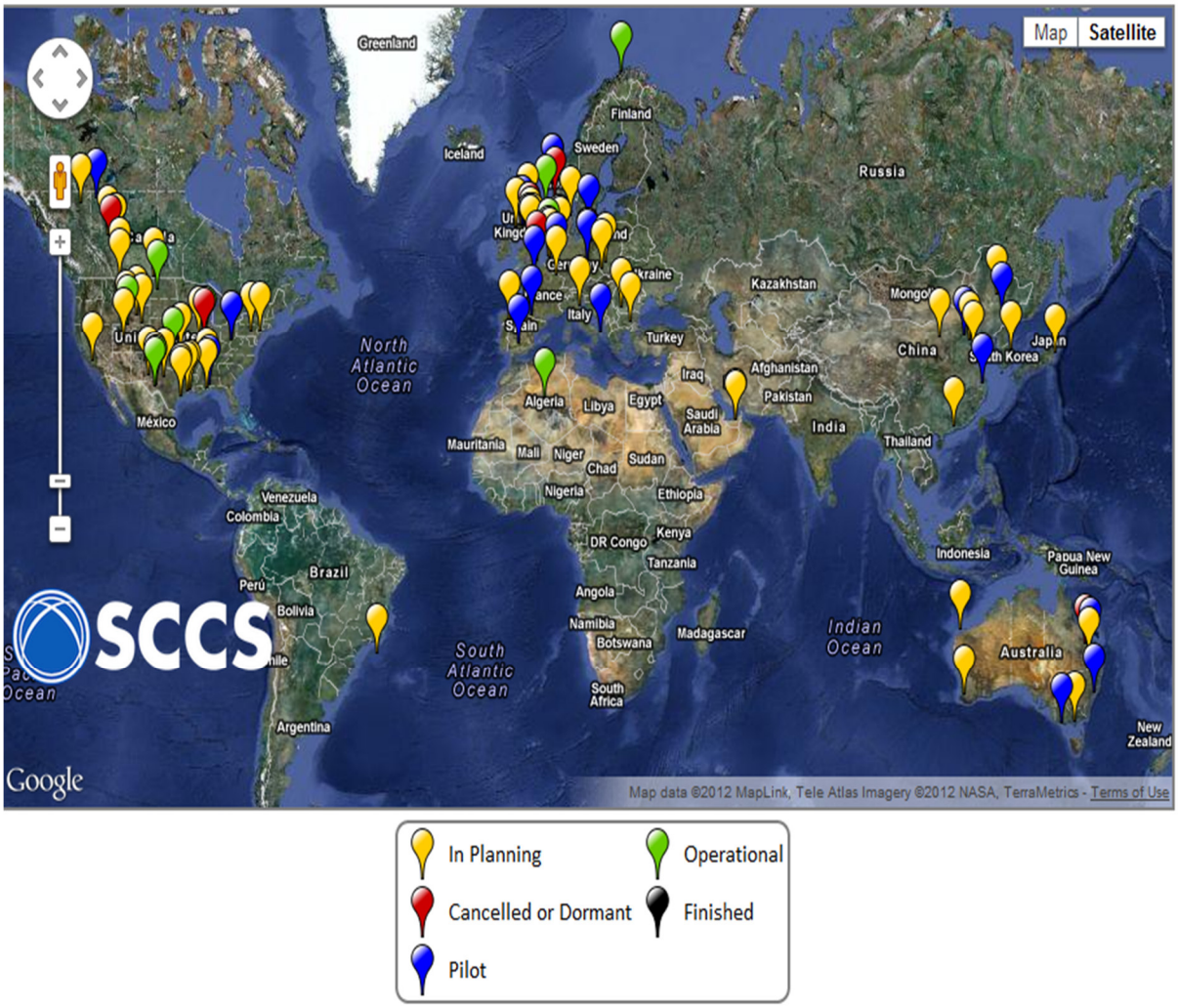
Abstract
Climate change is a fact of life. This has resulted in increased efforts to develop new technologies that will help mitigate this phenomenon. It is against this backdrop that Carbon Capture and Storage (CCS) technology attracted a lot of interest as an option that can help capture CO_2 in large quantities from fossil fuel plants and store it underground to prevent it from escaping into the atmosphere. The study seeks to assess the legal and regulatory frameworks for effective deployment of the CCS technology as a climate change mitigation measure. Secondary data in a form of books, articles, journals and other legal documents were used as the basis for qualitative analysis. The paper found out that though there are available some national and international legal instruments, some pertinent issues such as the long term liability, costs, environmental, legal, definition and classification of CO_2, access and property rights as well as an intellectual Property Rights need to be addressed before Carbon Capture and Storage Technology can be deployed effectively as a climate change mitigation option.
Keywords: Carbon dioxide Capture and Storage, Climate Change Mitigation, Legal and Regulatory Framework

1.0 Introduction

Climate Change (CC) is a fact of life.[1]In the past century, global temperatures are known to have risen at least by 0.74^0C as a result of increased Greenhouse Gas emission into the atmosphere. Climate change is not a cause of one factor but an interaction of different variables.[2]The problem of climate change is global and long standing which may have significant international and intergenerational consequences in terms of equity and sustainable development.[3] According to the Intergovernmental Panel on Climate Change (IPCC) report in 2007, climate change as a result of CO_2 emissions into the atmosphere is unequivocal. The report further showed that the concentration of CO_2 emissions is now far more than the levels that scientists in the past identified. The effects of climate change are cross-generational with women more likely to be affected. World Health Organization (WHO) in 2000 estimated that over 150,000 deaths are caused each year as a result of climate change.[4]The country currently highly affected by climate change is Bangladesh yet Bangladesh produces insignificant levels of CO_2 emissions relative to the United States (US) and China. This trend gave rise to what has now come to be known as 'climate genocide' with millions of people moving away from such areas.[5]

[1] Urry, J, (2011), Climate Change and Society, Polity Press, 2011, Cambridge UK p5-6
[2] ibid p5
[3] Climate Change 2001: Mitigation, Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, 2001 p3. Climate genocide; many people dying due to flooding, drought and other negative effects of CC.
[4] ibid p3
[5] ibid p3

GLOBAL CCS MAP



Source: The Scottish Centre for Carbon Storage interactive world map at http://www.sccs.org.uk/map.html (last time visited May 3, 2012)

Though the planet earth may be able to endure the changing trends of the climate, many forms of human habitation would not be able to adapt even if predictions based on scientific uncertainties are even partially correct.[6] It is this bleak future that led to the search for Climate Change Mitigation (CCM) measures in this age of ours. Climate Change Mitigation is concerned with taking actions by man to reduce the concentration of Greenhouse Gas (GHG) emissions and their effects on the global environment. Climate Change Adaptation however, entails the adjustment of mankind to live with Global Warming (GW). Mitigation in the context of climate change could be seen also as man's intervention to reduce CO_2 emissions into the atmosphere.

Most means of climate change mitigation measures appear preventive rather than reversing the existing trend. To achieve this objective of climate change, there are various climate change mitigation options such as the use of alternative energy sources (renewable energy, nuclear power); energy efficiency and conservation (transportation, afforestation); geoengineering (Greenhouse Gas emissions, biomass energy where Carbon Capture and Storage (CCS) technology originated) governmental and International actions (Kyoto Protocol, encouraging use of subsidies, carbon emissions trading, emission tax).

These measures coupled with the scientific consensus on climate change and the precautionary principle, led to an increase in efforts to develop technologies such as Carbon Capture and Storage in order to tackle climate change. This study therefore seeks to evaluate the international and national legal instruments of Carbon Capture and Storage technology as a climate change mitigation option. The paper is organized into five parts. Part One is the introduction; Part Two constitutes the background to the study. Part Three provides an inventory of existing national and international legal instruments for Carbon Capture and Storage. It explores how various regulatory

[6] The UNFCCC (Conference of Parties-the Copenhagen Protocol): Background Paper A: Setting the Targets, COP 15, 2009 p6

frameworks are harmonized for the effective deployment and implementation of the Carbon Capture and Storage technology. Primary and secondary data are used where the relevant international and national legal instruments present the basis for qualitative analysis. Part Four focuses on legal and regulatory issues of Carbon Capture and Storage relating to liability, injection and storage, Intellectual Property Rights (IPR), cost, transportation, while Part Five concludes the paper with some critical recommendations.

2.0 Background to the study

"Rapid commercial development and deployment of clean coal technologies, particularly carbon capture and storage, will help position the United States as a leader in the global clean energy race."

US President, Barack Obama
February 3, 2010

There is increasing interest worldwide in developing Carbon Capture and Storage as a Greenhouse Gas mitigation strategy. The first legal workshop on Carbon Capture and Storage was organized and held in Paris in 2004 by the International Energy Agency (IEA) to discuss legal issues regarding Carbon Capture and Storage in the national and international law. IEA subsequently published a paper entitled "*Legal Aspects of Storing CO_2*" (IEA, 2005) that highlighted five thematic legal and regulatory areas that needed further discussion and analysis. The areas included:

- The number of CO_2 demonstration projects
- Governments should provide comprehensive and appropriate national legal and regulatory framework for Carbon Capture and Storage demonstrated projects
- Contracting States to international conventions or treaties should be willing and ready to seek clarifications in legal issues regarding the protection of the marine environment and its resources
- Governments should also provide a level playing-field for Carbon Capture and Storage alongside other climate change mitigation technologies
- And that both the public and private sectors should work tirelessly at gaining public support and acceptance of Carbon Capture and Storage.[7]

In October 2006, a second workshop was organized to consolidate the progress and the commitments made. Many of the efforts of the second workshop were based on learning from global case studies that were collated from experiences of legal and regulatory developments.[8]

The United Nations Framework Convention on Climate Change (UNFCCC) provides for the stabilization of Greenhouse Gas concentration in the atmosphere at levels sufficient enough to prevent dangerous anthropogenic impacts on the climate system. The only provisions important for CO_2 storage in United Nations Framework Convention on Climate Change are captured in its Annex 10.[9] Just like the 1992 United Nations Framework Convention on Climate Change, the only point where CO_2 is mentioned in the 1997 Kyoto Protocol is in its Annex 11 where CO_2 is seen as a climate change mitigation option geared towards addressing anthropogenic emissions at source[10]. In situations where CO_2 storage takes place within the territorial land and waters, domestic laws are applicable. In contrast, if CO_2 project activities take place offshore in international waters, a number of international legal and marine environmental protection instruments (such as 1982 United Nations Convention on the Law of the Sea (UNCLOS), 1972 London Convention) are triggered because of potential risks to the marine environment associated with CO_2 leakage. The main provisions of UNCLOS with reference to Carbon Capture and Storage are enshrined in its Annex 6.[11]

In 2008, the IEA forecast that CO_2 emissions attributed to the energy industry would rise by 130% by 2050 in the absence of any action oriented policies or strategies. Carbon Capture and Storage in this regard not only plays an important role in climate change mitigation, but also a cost-effective option for limiting CO_2 emissions from large scale industrial plants into the atmosphere.[12]

The only technology currently available that can help mitigate the impact of CO_2 from large scale fossil fuel source plants is Carbon Capture and Storage as captured by the words of the US Energy Secretary Steven Chu (May15, 2009) *"To prevent the worst effects of climate change, we must accelerate our efforts to capture and store carbon dioxide in a safe and cost-effective way. This funding will both create jobs now and help position the United States to lead the world in the Carbon dioxide Capture and Storage technologies, which will be in increasing*

[7] Legal Aspects of Storing CO_2at http://www.iea.org/textbase/nppdf/free/2007/legal_aspects.pdf (last time visited May 1, 2012)
[8] ibid
[9] Carbon Capture and Storage: Full Scale Demonstration Update, International Energy Agency, 1974-2009, OECD/IEA 2009 p3
[10] ibid p3
[11] ibid p3
[12]Technology Roadmap: CCS in industrial Applications, IEA, United Nation Industrial Development Organization, 2011 p7

demand in the years ahead".[1] This notwithstanding makes Carbon Capture and Storage an important component of a portfolio of technologies that can assist tackle and achieve deep global emissions reductions.[2]Research shows that Carbon Capture and Storage has the potential to reduce CO_2 emissions by up to 4.0 gigatonnes yearly by 2050 from industrial plants representing 9% of the target reduction levels needed to halve CO_2 emissions related to energy.[3]While this paper is about the legal and regulatory aspects of CO_2 storage, CO_2 storage cannot be discussed separately from CO_2 capture and transport. Carbon Capture and Storage entails the capture and storage of CO_2 emissions, thereby preventing it from escaping into the atmosphere. Carbon Capture and Storage technology is a life cycle process- comprised of three fundamental stages: CO_2 capture, CO_2 transportation and finally CO_2 storage. These three stages are integrated in a chain.

2.1 CO_2 Capture

CO_2 capture is an important move towards a low carbon future. The process of CO_2 capture encompasses the collection of CO_2 emissions produced from large scale plants such as steel, iron, cement and coal-fired power generation plants where CO_2 is emitted in substantial quantities. Thus, CCS technology is positioned at a large scale power plant where it captures CO_2 and separates it from flue gases.[4] For example, in 2002, about 35% of UK UK CO_2 came from the energy sector relative to 2% from the chemical industry. Therefore, applying the CO_2 capture to the UK energy sector would help reduce CO_2 emission levels significantly.[5]

There are three technology options for capturing CO_2 emissions: post-combustion, pre-combustion and oxyfuel. The technological process in pre-combustion is more sophisticated than in post-combustion, making it difficult to retrofit the former.[6] In the oxyfuel technology process, oxygen is used for the combustion of fuel rather than air. The approach to use in the capture process depends on the type of fuel used in the power plant and the technological make up of the plant in question.[7]

2.2 CO_2 Transportation

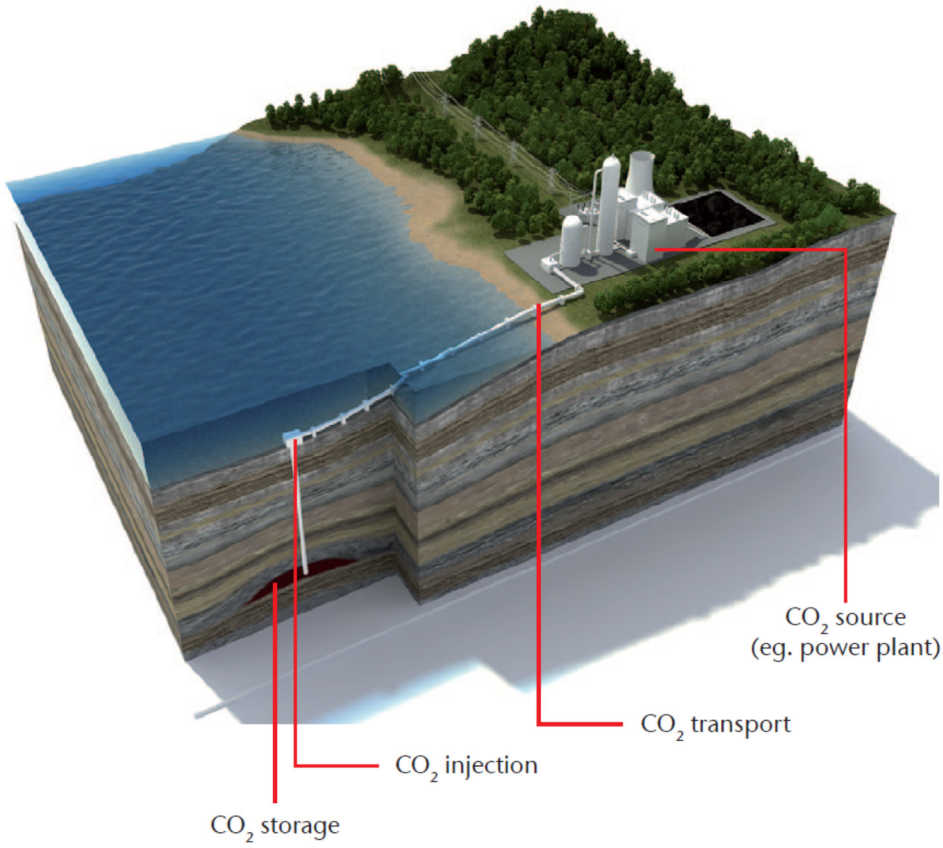
Before CO_2 is transported, it is captured as a gas and then compressed in order to reduce its net emissions. CO_2 transportation is usually done either using tankers or pipelines.[8] Tankers are used when small volumes of CO_2 projects are involved while in larger volume projects, pipelines are the practically available options. Transportation of CO_2 by pipelines is a proven technology where in the US and Canada over 3,000 kilometers of pipelines are used each year to transport CO_2 for Enhanced Oil Recovery (EOR).[9] An example is the Canyon Reef Carriers Pipeline (140 miles) in Texas which has been used for Enhanced Oil Recovery since 1972.[10]

2.3 CO_2 Storage

The Carbon Capture and Storage component is the hardest to secure now.[11] Besides the legal issues, there is political discourse whether to allow or ban the geological storage of CO_2. It involves injecting CO_2 into underground geological structures such as coal seams, oil and gas fields, and salime structures where the CO_2 is stored long enough for it to decompose.[12] CO_2 is stored in most cases beneath an impermeable rock that prevents the CO_2 from moving to the surface of the earth. Hydrocarbons have been stored underground for decades indicating that CO_2 can also be contained in these structures over long periods of time.[13] The extraction process of these hydrocarbons may have damaged the geological structures anyway and so effectively capping is a technology that may overcome such a risk.[14] The figure below shows how CO_2 is captured, transported, injected and stored.

[1] DOE/NETL: Carbon dioxide Capture and Storage, RD&D ROADMAP, US Dept of Energy, Dec. 2010 p6
[2] ibid p6
[3] supra note 12 at p7
[4] The Parliamentary Office of Science and Technology, POSTNOTE 238: Carbon dioxide Capture and Storage (CCS), March 2005 p1
[5] ibid p1
[6]Forsyth, J., CO_2 Capture, Fundamentals of Carbon Capture and Storage, p 69 (Petroleum Economist, 2007). p69
[7] ibid p73
[8] supra 17 p2
[9] ibid p2
[10] ibid p2
[11] ibid p2
[12] ibid p2
[13] ibid p2
[14] ibid p2

FIGURE 1.0 CCS PROCESS



Source: IEA Technology Roadmap at http://www.iea.org/papers/2009/CCS_Roadmap.pdf (last time visited May 6, 2012).

The major challenges facing the effective deployment of the CCS technology are issues ranging from public acceptance, liability, property rights, technology, costs, finance and legal and regulatory framework. For the purpose of this paper, the focus would be on the legal and regulatory aspects of these issues.

3.0 International and National legal instruments for Carbon Capture and Storage

Policy and law reform is a continuous process. Initial research is carried out, policy issues are documented and presented to the necessary authority, then primary legislation is drafted and once the legal framework is passed and in force, a further testing can be made of it so as to allow for amendments to improve its performance. Carbon Capture and Storage policy and law is not an exception in this regard.

3.1 International legal instruments

3.1.1 United Nations Framework Convention on Climate Change and the Kyoto protocol

Starting at the international level, in the 16th Conference of Parties (COP 16) negotiations on Climate Change in Cancun, Mexico, it was decided that Carbon Capture and Storage should be included in the Clean Development Mechanism (CDM) portfolio of project activities subject to critical scrutiny of issues in a more balanced manner.[1] In December 2011, new progress was made at the 17th Conference of Parties to the United Nations Framework Convention on Climate Change in Durban which has the potential to influence Carbon Capture and Storage projects everywhere in the world including developing countries. Clean Development Mechanism now allows for CO_2 emissions reduction projects to be undertaken in non Annex I (developing countries) to earn Certified Emission Reductions (CERs) in proportion to the CO_2 emissions that the project avoids.[2]

The COP 17 also discussed issues inter alia prevention of leakage, ownership rights and long term liability, CO_2 capture, transport and storage in geological formations within the national frontiers. The issue of transboundary movement of CO_2 for storage is due for discussion in December this year (2012) in Qatar.[3]

[1]Calum, Hughes, Carbon Capture Journal: Review of 2011, 2012 - a crucial year for UK leadership in CCS, CCS in the CDM -outcome at Durban, Ionic liquids for CO_2 capture, Jan/Feb 2012, Issue No. 25 p6
[2]ibid p8
[3] ibid p6

3.1.2 The 1996 London Protocol

London Protocol (LP) forbids dumping of waste materials from vessels or man-made sources into the sea.[1] London Protocol also sets out a general prohibition on the transport of waste substances to other countries for dumping as contained in its Article 6.[2] The Carbon Capture and Storage legal and technical team under the London Protocol in 2008 established that Article 6 would require amendments to allow for CO_2 storage as such.[3] Based on this, the contracting parties concerned in 2009 resolved that Article 6 of the London Protocol should be amended to allow for cross border export of CO_2 on certain conditions[4] such as: disposal of the CO_2 into sub seabed, the dumping consists of CO_2 and the processes used in the capture and sequestration are allowed and finally no other waste is included for the purposes of disposal[5]. The amendment requires two thirds (27 out 40) of the contracting parties approval by way of ratification to come into force.[6]

Achieving the above number posed a serious challenge. Currently only Norway has ratified the Article 6 of the London Protocol. The IEA preliminary analysis showed that sixteen (16) out of the forty (40) contracting parties to the London Protocol are pursuing Carbon Capture and Storage development. Of the sixteen countries, not all have shown interest in the offshore storage of CO_2 or CO_2 export to other countries, making the ratification of the amendment of the Article 6 a less crucial matter.[7]

2.1.3The 1989 Basel Convention

The Basel Convention (BC) was established to set out a clear and a comprehensive framework for the control of international trade in hazardous and other waste materials. The Basel Convention requires that the transboundary movement of waste substances be brought to the barest minimum level in line with good environmental practices. Underlying this approach is the principle of good neighborliness (Bon Voisinage) thus wastes should be disposed of within the territories where they are generated. The convention applies substantively to 'hazardous wastes'.[8]

There is therefore a public debate as to whether CO_2 could be considered as being part of the so called 'hazardous wastes' for the purposes of export. Most of the contracting states opined that Basel Convention does not apply to CO_2, but the Netherlands and some environmental groups such as the Greenpeace take a contrary view that Basel Convention does apply to the transboundary movement of CO_2.[9] If CO_2 is considered as being a hazardous waste under the Basel Convention, it means that the transboundary movement of it would be illegal.

3.2 National legal and regulatory framework for some selected jurisdictions

Jurisdictional issues about Carbon Capture and Storage regulatory framework vary from country to country and even within a country it may differ from state to state. While some countries regulate Carbon Capture and Storage project activities at the central or national level, the whole process of Carbon Capture and Storage could be complex in other countries. This chapter leads to some key areas of national and regional legal developments of Carbon Capture and Storage in the European Union (EU), UK, Norway, and Australia.

3.2.1 The European Union

At the regional level, the EU Directive (CCS Directive 2009/31/EC) on geological storage is the primary piece of legislation relevant to Carbon Capture and Storage activities.[10] The Directive is binding on Member States only with respect to the achievement of set targets thereby leaving Member States to exercise some degree of discretion as to the choice of the procedure and techniques to be used to implement the Directive. The Directive seeks to establish the legality of CO_2 storage and the responsibilities and obligations that are assigned to the site operator.[11] The Directive provides that once the injection and storage process is complete, the operator is obliged to monitor and maintain the storage site in agreement with a post closure plan for at least 20 years and then the legal liability is transferred to the state.[12] The post closure plan is usually drafted at the time the site permit is sought, but it is subject to amendments.[13] After the closure, the operator is still obliged to provide financial security to the state to continue monitoring the site for another 30 years. The amount of money involved is subject to amendment.[14]

[1] International Energy Agency Carbon dioxide Capture and Storage: Legal and Regulatory Review, Edition 2, May 2011 p16
[2] ibid p16
[3] ibid p16
[4] ibid p16
[5] nzec Carbon Capture and Storage: International CCS Policies and Regulations, WP5. 1a/WP5.4 Report p6
[6] supra 30 p16
[7] ibid p16
[8] Baker and McKenzie Report to the Global CCS Institute on Legal and Regulatory Developments Related to Carbon Capture and Storage between November 2010-June 2011 p21
[9] ibid p22
[10] Hughes, C., Carbon Capture Journal: CCS legal and policy , CCJ Issue No. 25, Jan / Feb 2012
[11] ibid
[12] ibid
[13] ibid
[14] ibid

These requirements are very difficult to reach and indeterminate at the time the project financier is trying to reach a final investment decision. This makes the costs involved in Carbon Capture and Storage projects uncertain. The Directive also addresses third party issues relating to CO_2 transportation and storage infrastructure.[1] In 2009, the Emission Trading Scheme Amendment Directive was introduced. This Directive allows for CO_2 to be stored geologically under the directives of the 'CCS Directive'[2].

3.2.2Australia

A number of Carbon Capture and Storage projects have been proposed in Australia (Gorgon project) requiring the development of a comprehensive regulatory framework for them.[3] There has been a lot of progress made in Australia concerning Carbon Capture and Storage and most of these developments occur at the Federal level.

The Federal government of Australia, based on their existing petroleum legislation, made a series of amendments to accommodate Greenhouse Gas substance (hereafter known as CO_2 in this paper) storage offshore in its regulatory framework. This framework was established under the Offshore Petroleum Act, 2006, now rechristened as Offshore Petroleum and Greenhouse Gas Storage Act (OPGGSA) which took effect from November 22, 2008.[4] This Act was amended primarily to create a system of offshore ownership for CO_2 storage, and a framework for long term liability to the government after site closure by the operator for at least fifteen years. According to OPGGS Act, offshore comprises of an extension of three nautical miles from the baseline of Australian territorial waters to the external borders of the continental shelf.[5]

The last two amendments came into force in April and June 2011 respectively.[6] Each amendment was made to include an aspect of the CO_2 activities on the environment, for instance, OPGGS (GHG injection and storage Regulation, 2011) was amended to take care of CO_2 injection and storage issues.[7] There is nowhere in the Act where the issue of costs mentioned. Australia also developed two sets of non-binding principles to promote a consistent approach applicable to Carbon Capture and Storage activities; regulatory guiding and geological storage principles.[8] There are developments too at the State level.

3.2.3 The United Kingdom

In the UK, there are two fundamental primary legislations related to Carbon Capture and Storage; the Energy Act 2008 and Climate Change Act 2008.[9] The Energy Act was the first milestone in their effort to legitimize Carbon Capture and Storage activities. This Act established some storage zones where gas was imported and stored with the Crown being the property rights owner. Until the Crown grants permission, storage of CO_2 in these zones is illegal.[10] It is then allowed to store CO_2 together with Enhanced Oil Recovery.[11]

The second legislation is the Climate Change Act of 2008. This Act established UK carbon budget system and granted the Secretary of State the responsibility to make sure that the UK's CO_2 emission levels are reduced by 34% by 2020 and 80% by 2050 relative to the 1990 levels.[12] These targets are what is pushing for Carbon Capture and Storage development and deployment. There are also other laws, regulations and policies important to Carbon Capture and Storage such as the tax law regarding transferring oil and gas equipment for Carbon Capture and Storage purposes and the Pipeline safety regulatory requirements and interpretation.[13]

3.2.4 Norway

Norway is said to be a global leader in Carbon Capture and Storage project of activities (Sleipner field) since 1996.[14] Despite this pioneering lead by Norway, up to date, Norway still has no comprehensive legal framework regarding Carbon Capture and Storage aside from some amendments made to the 1963 Continental Shelf Act, 1981 Pollution and Waste Act and the 1996 Petroleum Activities Act.[15]

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[1] ibid
[2] ibid
[3] Carbon dioxide Capture and Geological Storage: Australian Regulatory Guiding Principles, Ministerial Council on Mineral and Petroleum Resource sat http://www.ret.gov.au/resources/Documents/ccs/CCS_Aust_Regulatory_Guiding_Principles.pdf (last time visited April 23, 2012)
[4] ibid
[5] ibid
[6] ibid
[7] ibid
[8] ibid
[9] ibid
[10] ibid
[11] ibid
[12] ibid
[13] ibid
[14] Carbon Capture Legal Programme: Case studies on the implementation of Directive 2009/31/EC on the geological storage of Carbon dioxide, November 2011
[15] ibid

Norway is not an EU country rather an European Economic Area (EEA) as qualified by the Carbon Capture and Storage Directive as being European Economic Area relevant.[1] This implies that Norway must also implement the EU Directive as a member state of the European Economic Area.

Norway surprisingly has no national legislation to regulate Carbon Capture and Storage activities. It is still in the process of transposing the EU Directive into its national legal system. Despite these legal deficiencies, it is committed to Carbon Capture and Storage projects (Sleipner Field, regulated by the Petroleum Activities Act, Monstad and Karsto projects).[2] It is clear that Norway has to concentrate on the legal and the CO_2 capture aspects of Carbon Capture and Storage technology since it has the necessary support of the government and the transportation and storage infrastructure in place (in 2011 the Norwegian government apportioned 2.7 billion NOK thus €351 million for Carbon Capture and Storage activities and also pledged an additional 2.9 billion NOK thus €377 million equivalent for Mongstad project and Gassnova and research as well as public education).[3]

4.0 Legal and regulatory issues of Carbon Capture and Storage

Interest in Carbon Capture and Storage has grown in recent years as various governments see the need to use technology to address the problem of CC and improve world energy security. It is apparent that CCS technology will not go anywhere without an effective legal framework and guidelines especially regarding issues of liability, property rights, cost, and transport. There are no comprehensive and uniform regulatory frameworks specifically relating to CCS either at the national or international level. Regulatory issues for CCS are now on case-by-case basis. These regulatory frameworks were designed to deal with specific projects and cannot be used to cover activities outside of the project regulatory requirements. Various issues identified by this paper range from storage, property rights, liability, transportation, costs among others.

In the storage of CO_2, there are two legal issues that can be identified; how CO_2 is defined and classified and then standards for storage sites design. How CO_2 is defined and classified as well as its storage process is very important in determining the kind and applicable law covering CCS activities. When CO_2 is stored, it is either seen as a waste product or an industrial project. This dichotomy needs to be drawn because industrial projects are not subject to the same environmental regulation as industrial waste. The latter is exposed to more rigorous environmental regulations than the former. The current industrial wastes were designed for substances other than CO_2 and therefore CO_2 is not currently subject to the same regulations.

The oil and gas industry, because of its engagement in Enhance Oil/Resource Recovery (EO/RR), tend to classify CO_2 as an industrial product because they use it to extract oil.[4] Environmentalists, Non-governmental Organizations (NGOs) and policy regulators who are concerned about the long term effects of CO_2, advocate that CO_2 is a waste product. CCS activities out of or without EOR elements are in a legal gray area because the distinction between what is an industrial product and non-industrial product is ambiguous. A good example is the European Court of Justice (ECJ), which in 2003 issued two different decisions concerning waste as a recovery mechanism and other as a clear case of disposal.[5] In the first instance, the ECJ determined that the use of fuel in cement plants was considered waste recovery and in the second, it decided that the export of waste for incineration purposes was seen as waste disposal, in spite of the fact that the latter case also entailed some kind of energy recovery. Although neither of the decisions directly relates to CCS, they do concern the definition and classification of CO_2 as being dependent on its usage. It also implies that if CO_2 changes from being an industrial product (EOR) to industrial waste (long term storage), then project financiers will have to obtain licenses for two different sets of projects.

What is more, even our existing international treaties and national laws and regulations have different legal treatments for CO_2 depending on how it is classified. Marine treaties such as the LP, UNCLOS and OSPAR allow for current CCS projects as industrial storage or ERR, all because the reason for the storage is not seen as disposal but as part of an industrial effort. Although the conventions allow for ERR, it is still not clear whether the conventions and treaties have any CCS activities or projects offshore. Since these treaties and conventions were established before CCS came into being, it is necessary that a new regime be developed to deal with all CCS activities.

The issue of classification becomes more complicated when it relates to onshore activities where jurisdictional matters of national and international law coincide. The only international treaty relevant to transborder CCS projects onshore is the BC. It is not however certain whether the BC is applicable to CO_2. Due to differences in interpretation by countries and environmental NGOs, there is still no formal agreement on the definition of CO_2 for the purposes of CCS.

[1] ibid
[2] ibid
[3] ibid
[4] Robertson, k., et al, International Carbon Capture and Storage Projects Overcoming Legal Barriers, Department of Energy/National Energy Technology Laboratory-2006/1236, June 23, 2006 p7
[5] ibid p8

Investment costs issues. IEA (2009) researched that, the total investment cost required for a CCS base plant from 2010 through to 2050 is about US$5 trillion.[1] On the average, about US$125 billion will be expended annually (2010-2050). An additional US$1.3 trillion is expected to be invested in the CO_2 capture technology component. Between US$1 to 0.5 trillion is estimated for CO_2 transport infrastructure ((pipelines). The cost of CO_2 storage is also valued between US$88 to US$650 billion in the same period.[2] These costs vary from region to region. These and other costs are issues that need to be addressed before CCS could be effectively deployed to achieve its desire objectives of mitigating CC.

One other crucial issue facing CCS development is long-term liability. Liability issues can be categorized into short term (operational) and long term (environmental transborder) liabilities with the many of the unresolved issues having to do with long term storage.[3]

Long term liability issues are either environmental, transborder or in situ. There must be regulations to assign liability and address any future damage likely to occur from future leakage of CO_2 that has the tendency to impact the global environment. Failure to address this issue could lead to very negative perceptions of CCS activities, making it difficult to obtain sites for injection and storage.

Another liability issue worth noting is the transboundary movement of CO_2. Liabilities involving more than one country, thus CO_2 leaking across national borders and consequently causing harm to the global environment. The international treaties and Intergovernmental agreements would require a clear distinction between national and international liabilities. It is possible for CO_2 to leak and move away from its injection and storage point, and if that leakage point is in a different country or international waters, there should be a regulation to determine which party is liable for remediation or restoration.

The issue of timeframe itself cannot be left unmentioned. In CCS related citations, long term liability is between fifty to two hundred years and beyond.[4] It is still not clear when a move from short term to long term should take place. Considering the fact that CCS projects are undertaken to last for thousands of years, it will be very difficult to establish an effective Measurement, Monitoring and Verification (MMV) scheme for such a period. One option to overcome this is to put in place some parameters and guiding principles to determine how long parties are liable and at what point liability can become a public liability.

Last but not least, who has or will have access to the CCS storage site must also be clearly defined. The main areas of property rights encompass; CO_2 itself, the site and the injection. Property rights have an indirect influence on liability. For CCS to be made commercially viable there must be a regulation to determine how and when property rights are transferred from the project operators or financiers to the government or the public and how those property rights are acquired because many of unsettled CCS issues are related to access and property rights. For offshore activities, these may come under the purview of international conventions where the regulatory framework and policy issues are undergoing development. However, very little legal framework currently exists for such property rights.

Lastly, the protection of Intellectual Property Rights (IPR) is a major issue especially between the developed and the developing world in terms of technology transfer.[5] The CCS process is technology driven; therefore, the existing and possible future technologies need to be protected. The developing countries need robust IPR regimes to encourage the developed countries invest in CCS technologies so that in future these technologies can be protected and safely transferred and deployed in the developing economies. New technologies are always needed to reduce cost especially at CO_2 capture stage. It is these technologies that are prone to IPR theft. It is not certain whether the holders of these IPR for the technologies will be in a position to license them because there is no effective regulatory framework to protect such technologies. Until trade related aspects of IPR regulations are transposed into national legislations and an effective enforcement procedure established, developed countries and their companies will not transfer or license their technologies to the developing economies.

5.0 Conclusion and Recommendations

5.1 Conclusion

The dilemma of CC is here with us. It is against this background that the need arises for various governments and international agencies to identify some CCM measures, of which CCS became the most viable option. CCS is the only technology now available that can capture CO_2 emissions in large quantities for storage underground.

This paper identified that there are various international conventions and treaties such as the

[1] International Energy Agency, Technology Roadmap : Carbon Capture and Storage, at http://www.iea.org/papers/2009/CCS_Roadmap.pdf (last time visited May 6, 2012, pg 23)
[2] ibid pg23
[3] supra 62 p12-13
[4] ibid p13
[5] ibid p10

UNFCCC/Kyoto Protocol, LC, BC which needed to be amended or ratified, and countries also needed to transpose these treaties and conventions into their national legal system to ensure effective deployment of CCS. Except for Norway, no other party to the BC has ratified Article 6 for it to come into force. No country so far has a consistent and a comprehensive national legal legislation dealing with CCS issues.

Further, some legal issues were also identified by the paper. Except for some demonstrated CCS projects (Sleipner, North Sea; Sallah, Algeria; Weyburn, Canada; K12B, Netherlands; Snohvit, Norway and La Barge, Wyoming) where CO_2 is defined and classified as an industrial waste, there is no legislation mandating it as an industrial waste. There are no standards for storage site and well-design even the existing CCS demonstrated projects use EOR standards. Who takes responsibility for long term environmental damage, who owns the CO_2, legislation to address IPR issues and who monitors the storage site in the long run are some of the legal issues that need to be addressed.

Finally, the paper was intended to examine the legal and regulatory framework for effective deployment of CCS technology as a CCM option. There should be a consistent and a comprehensive regulatory framework for CCS, as it will serve as an incentive for effective deployment of CCS technology.

5.2 Recommendations

Any serious recommendation of possible future developments will have to begin by assessing the past developments in retrospective. There should be a paradigm shift whereby existing project data can be used to develop internationally consistent guidelines for CO_2 storage project site identification, monitoring and long-term verification. Efforts are already underway at a number of organizations, but these efforts should be consolidated and standardized where possible. This will help address the public acceptance of CO_2 storage as a viable GHG mitigation option, and reduce costs for investors in early projects.

Also continuous efforts should be made to share national regulatory models internationally. A number of jurisdictions already have well-established oil and gas and other regulatory regimes that can be modified to incorporate CO_2 storage issues. For these jurisdictions, the focus should be on adapting these regulations to address, among other issues, long-term responsibilities that are unique to CO_2 storage. For developing countries without existing regulations, capacity building is recommended to share best practice models and adapt them to national circumstances. Intellectual property rights do not appear to present significant issues; however, it is recommended that future work monitor developments, collect models that can be shared, and focus on outreach and capacity-building efforts to enhance intellectual property regimes in developing regions.

With recent amendment to the London Protocol there is now a basis in international environmental law to regulate CO_2 storage in sub-seabed geologic settings. Other regional treaties may wish to explore the approaches that the London Convention has taken to come out with relevance for their contexts. The next thing to do will be to guide governments and CO_2 storage project proponents with guidance for monitoring and verification that will demonstrate the integrity of a proposed storage site with monitoring and mitigation safeguards in place. It is worth recommending that the question of purity should be addressed by national regulators and should not be a barrier to the application of these international treaties to CO_2 storage activities.

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